PROCEEDINGS

OF THE

MADRAS GOVERNMENT

IN THE

PUBLIC WORKS DEPARTMENT,

IRRIGATION BRANCH,

FOR THE

MONTH OF MARCH

Printed by Authority.

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1894.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

Read—the following paper :—

Telegram from the Secretary to the Government of India, Public Works Department, to the Secretary to the Government of Madras, Public Works Department, dated Calcutta, 1st March 1894, No. 46 A.I.

Your telegram 28th ultimo. Rs. 30,000 withdrawn current year's grant 49.

Order—dated 5th March 1894, No. 202 I., Public Works.

Communicated to the officers concerned for information with reference to G.O., No. 188 I., dated 28th February 1894.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
,, Superintendent of Works, No. I Periyár Division.
,, Examiner, Public Works Accounts.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 5th.

Recd. *Encl.*

G.O., 5th Mar. 1894, No. 202 I.

MARCH.

Periyar Project

Telegram from the Government of India accepting the surrender of Rs. 30,000 under 49 for Periyár main dam, communicated to officers concerned.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper :—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Periyár, 25th February 1894, No. 279 C.E.

In continuation of this office No. 277 C.E., dated 21st instant, I have the honour to submit, for sanction of Government, an estimate, amounting to Rs. 1,740, for purchasing 400 steel jumpers for use in this division.

ORDER—dated 6th March 1894, No. 205 I., Public Works.

The estimate submitted with the foregoing letter is approved. It should be re-submitted for the formal sanction of Government from the amount provided for further outlay under Tools and Plant in the revised estimate for the Periyár project submitted in Proceedings of the Madras Government, No. 97 I., dated 3rd February 1894, for the sanction of the Government of India as soon as that sanction is communicated to the Superintendent of Works, No. I Periyár Division.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
„ Superintendent of Works, No. I Periyár Division, with one estimate.
„ Examiner, Public Works Accounts.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 6th.

Recd. *Encl.*

G.O., 6th Mar. 1894, No. 205 I.

MARCH.

Periyar Project

Estimate of Rs. 1,740 for purchasing 400 steel jumpers for use in Periyár No. I division, approved with remarks.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following papers :—

No. 274 C.E.

Progress Report for January 1894.

General.—The Hindu festival of Pongal is an annually recurring hindrance to the works, drawing away a large number of coolies to their native villages. January 1894 was no exception to the rule, and up to the end of the month the population of the camps had hardly recovered its normal strength. The entire cessation of rain at the beginning of December, and the excessively dry weather which has since prevailed, had the effect of exhausting the Kumili reservoir so early as the 29th December, depriving the turbines of both the tunnel and the ghât wire-ropeway machinery of their motive power. With the exception, however, of these two rather serious drawbacks, there was nothing of importance to hinder progress on the works, and on the whole a satisfactory outturn has again to be recorded.

Health.—There was a slight improvement at Thekady in January as compared with December, especially with regard to fever. At Periyár there was a distinct improvement both in fever and in all other classes of sickness. One case of cholera occurred at Periyár, which ended in the man's recovery. His house was burnt down and its site well disinfected and no other case occurred. One man nearly lost his life from erysipelas supervening on a cut from a stone, but there were no other accidents of consequence. The hospital figures for the month were as follows :—

Camp.	Average population.	Daily average attendance.	Total treated.	Ratio sick to 1,000 of population.	Deaths.	Ratio deaths to 1,000 of population.
Periyár	3,710	153·26	1,516	408·62	7	1·88
Thekady	825	40·58	505	612·12	1	1·21

The enlargement of the hospital at Periyár was nearly completed and will be a great convenience.

Rainfall.—Periyár 0·18 inches, Thekady 0·08 inches, which all fell on one day.

Main Dam.—The amount of material built into the dam during January was once again in advance of any month's work as yet recorded. The quantities were as follows :—

	CUBIC FEET.
Concrete	126,462
Rubble	45,888
Total ...	172,350

The above amount of concrete is also some 2,000 cubic feet beyond anything yet accomplished in one month. Notwithstanding the heavy demand, the stock balance of each material was maintained or increased with the exception of stone, which was considerably reduced, but is still sufficiently large. The stock of sand, though slightly increased, is still so low as to cause much anxiety. This is chiefly due to the small outturn of the new steam sand-dredger, the somewhat complicated machinery of which is rather beyond the powers and experience of the class of drivers that

can be induced to seek work in the remote and unhealthy climate of Periyár. The dredger, if regularly and carefully worked, is equal to the demand upon it, and, with the improvement that will be effected with a few more weeks' practice, it is hoped that this possible cause of delay will be permanently removed. The difficulty of closely supervising the working of it is increased by the present distance of the sand beds from the dam.

Two photographs of the dam were taken at the close of the month and accompany this report. Each is taken, as will be seen, from immediately on the down-stream side of the dam, one from each flank.

The leaks in rear were examined and exhibited no material change.

Left bank escape.—Excavation of foundations was proceeded with and solid rock disclosed over a part of the area at a depth of about 15 feet below ground level, being at about R.L. Periyár datum + 104 at the lowest or middle point.

Water-shed tunnel.—The reservoir having run dry in the last days of December, no machine work was practicable from the north end, and only 15 feet advance was made by hand at that face. At No. 2 shaft 100 feet was again taken out. A small spring was met with in the course of the month, but is well within the powers of the pump and has therefore caused no hindrance. Six feet was taken out by hand at the south face of the No. 2 shaft boring, and only about 4 feet of rock therefore now prevents the meeting of this boring with that from No. 1 shaft. Were it intended to continue work at the northward face of No. 2 shaft boring, it would be advisable to retain this small barrier of rock to keep off floods which might find their way in at the southern end of the tunnel. Proposals have been submitted, however, to the Chief Engineer for abandoning work at No. 2 shaft as soon as the existing stock of fuel is exhausted and for finishing the tunnel by water power from the north end, when the Kumili reservoir fills again in June. The tunnel will thus be completed in August instead of in May; but the cost of maintaining a tunneller and staff for 3 months longer will be very much more than compensated for by the difference in cost between the steam machinery at No. 2 shaft and the water machinery at the north end. The tunnel will still be completed several months before it can be required to be brought into operation. The small barrier of rock between the No. 1 and the No. 2 shaft borings will therefore be removed at once and a meeting effected, the No. 2 shaft boring continued so long as the fuel holds out (probably till the end of February) and the work will then be left until June or July, when the Kumili reservoir will be sufficiently full to start operations at the north end. A gang of machine drillers only will be maintained, drilling by hand, in order to ensure their being on the spot to renew machine work as soon as the water power becomes available.

Water-shed cutting.—About 26,000 cubic feet of stone was removed from the cutting during the month. Its completion may be looked for very early in 1894–95.

Transport.—The ghât wire rope was taken down and the serviceable lengths of it cut out. Three new posts were also in course of erection. By canal about 14,000 cubic feet of limestone were transported from the Thekady depôt to No. 2 dam, from whence the same quantity was carted by road to Periyár.

PERIYAR, 13th February 1894. (Signed) S. D. PEARS, Supdt. of Works, No. I Periyár Divn.

To the Chief Engineer, Public Works Department.

Note by the Chief Engineer, Public Works Department.

Submitted for the information of Government.

The progress on the main dam continues to be eminently satisfactory, and the position at the end of the season will be more favorable than could have been anticipated a few months ago. The steady and systematic progress which is now being made and the excellent manner in which the labour is being organised reflects great credit on Mr. Pears and his staff and not the least on Lieutenant Bragg who is in immediate charge of the dam.

I had originally proposed to push on the tunnel to completion by steam from No. II shaft and by hand from the north end, so that it would probably be completed

by the middle of May ; but Mr. Pears has explained that the existing stock of fuel at No. II shaft will only last till about the end of this month, that to collect a fuel supply for three months more work will occupy labour which at this time we can ill-spare; and that at present the difference of cost between steam and water power is about Rs. 30 per running foot, which would probably be slightly increased if fresh fuel has to be used instead of the well dried stock we are now using.

I have therefore approved his proposal to stop work from No. II shaft on the exhaustion of the present stock of fuel, and leave the remaining length (about two hundred feet) to be completed from the north end as soon as water is available ; this will defer the completion of the tunnel till some time in August, the exact date depending upon that of the setting in of the south-west monsoon, and will involve an extra cost of about Rs. 2,000 in establishment and contingencies against a saving of some Rs. 6,000 in cost of work. The services of the head tunneller (Mr. Mathews) will be required for about a month beyond the date (27th June 1894) to which the present sanction extends, and, unless orders to the contrary are received, they will be retained in anticipation of the sanction of the Government of India, which will be formally applied for when the exact date is known.

The difficulties in the supply of sand noticed by Mr. Pears are increased by the position in which the dredger has to work; it is all the steam launch can do to keep pace with requirements in the matter of transport of materials on the lake, and in order to enable it to do so the dredger has to work in very deep water and in a sand bed which is so nearly exhausted that the bucket frequently comes up only half full. As soon as the new steamer arrives the dredger will be moved to a new bed higher up the river where it will not only work in shallow water, but have a much better position to work in; when this takes place I do not think there will be any difficutly in regard to the sand supply.

I have just visited the works, and up to the date of my departure (19th instant) the rate of progress on the main dam had been fully maintained, so that the outturn in February will be little if at all below that of January ; after that it must be expected to fall off. Stocks of material appear, however, to be running dangerously low and every effort must be made to replenish them during the recess.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

23rd February 1894.

ORDER—dated 7th March 1894, No. 209 I., Public Works.

Recorded and communicated to the Government of India.

[Here enter No. 210 I., dated 7th March 1894.]

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintendent of Works, No. I Periyár Division.
„ the Chief Engineer for Irrigation.
„ Revenue Department.

ENDORSEMENT—dated 7th March 1894, No. 210 I., Public Works.

Copy of the above forwarded to the Government of India.

(By Order.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

IRRIGATION.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 7th.

Recd. *Encl.*

G.O., 7th Mar. 1894, Nos. 209, 210 I.

MARCH.

Periyar Project

Forwarding copy of Proceedings recording the progress report of works of No. I Periyár division for the month of January 1894.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

Read—the following paper :—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Periyár, 13th February 1894, No. 272 C.E.

I have the honour to submit herewith, for the sanction of Government, two revised estimates, viz., for maintenance of Thekady-Periyár road for 1893–94 and maintenance of ghât wire ropeway for 1893–94, amounting respectively to Rs. 4,235 and Rs. 6,785. The comparative statements attached show the items on which the excesses have occurred.

On the road, the excess is due simply to the fact that, with the heavy traffic of the past year, amounting often to two or three hundred carts per day, and with the heavy rain of this climate, the original provision was not enough to keep the road in good working order. None but absolutely essential repairs have been carried out, and waste of money on these has been reduced to a minimum by ample and trustworthy supervision. I propose to allow the road to deteriorate from henceforward. It has been of the greatest utility to the works and it is probably not too much to claim that the whole cost of its construction and maintenance has been repaid several times over in cheapness and speed of construction on the main dam. Next season will be the last for which it will be required and next year's repair estimate will consequently be a merely nominal one to provide for repairing any dangerous bridges or impassable pieces of roadway which may be found necessary during the short remaining period of its existence.

On the ghât ropeway two-thirds of the excess is directly attributable to the failure of the rope reported in my No. 226 C.E., dated 14th December 1893. The rope appears to have met with a good deal of unfair treatment at the outset on its journey from England to Thekady which would disarm Government of any claim against the makers. The consequence, whether of this or of original bad quality (probably of both), has been so rapid a deterioration that, for the last 4 months of its working, scarcely a day has elapsed without a splice or a new strand being found necessary.

Order.—dated 8th March 1894, No. 212 I., Public Works.

The revised estimates, amounting respectively to Rs. 4,235 and Rs. 6,785, for the maintenance of the Thekady-Periyár road and of the ghât wire ropeway for 1893–94, involving a total excess of Rs. 4,510 over the estimates aggregating Rs. 6,510 sanctioned for the works in G.Os., Nos. 277 I. and 836 I., dated 28th March and 25th September 1893, respectively, are approved. The revised estimates should be

resubmitted for the formal sanction of Government as soon as the sanction of the Government of India to the revised estimate for the Periyár project, printed in Proceedings of the Madras Government, No. 97 I., dated 3rd February 1894, is communicated to the Superintendent of Works, No. I Periyár Division.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
,, Superintendent of Works, No. I Periyár Division.
,, Examiner, Public Works Accounts.
,, Revenue Department.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 8th.

Recd. *Encl.*

G.O., 8th Mar. 1894, No. 212 I.

MARCH.

Periyar Project

Revised estimates, amounting respectively to Rs. 4,235 and Rs. 6,785, for the maintenance of the Thekady-Periyár road and of the ghât wire ropeway for 1893–94, approved with remarks.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper :—

From R. G. MACDONALD, Esq , Deputy Secretary to the Government of India, Public Works Department (Account—Irrigation), to the Secretary to the Government of Madras, Public Works Department, dated Calcutta, 27th February 1894, No. 43 A.I.

With reference to your telegram of the 23rd instant, I am directed to state that the sums of Rs. 8,000 and Rs. 18,156 therein surrendered from the grants for 1893–94, under 49. Irrigation and 42. Major Works—Working expenses, respectively, have been withdrawn.

2. With these reductions, the grants for 1893–94, under 49. Irrigation and 42. Major Works—Working expenses, will stand at Rs. 17,92,000 and Rs. 11,50,191.

ORDER—dated 8th March 1894, No. 220 I., Public Works.

Communicated to the officers concerned, for information with reference to G.O., No. 179 I., dated 23rd February 1894.

(True Extract.)

(Signed) R. R. E. DRAKE-BROCKMAN, Lt.-Col., R.E.,
Joint Secy. to Govt., P.W.D ,
Irrigation Branch.

To the Chief Engineer for Irrigation.
„ Examiner of Public Works Accounts.
„ Superintending Engineer, VI. Circle.
„ Revenue Department.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC. WORKS.

Dated March, 8th.

Recd. *Encl.*

G.O., 8th Mar. 1894, No. 220 I.

MARCH.

Funds

Letter from the Government of India, accepting the surrender of — from the grants for 1893–94, under 49. Periyár Project and 42. Major Works (Working expenses), communicated to officers concerned.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Periyár, 27th February 1894, No. 281 C.E.

I have the honour to inform you that the cholera, which broke out in Periyár camp the day before you left, has developed into a severe epidemic. Forty cases have occurred up to this morning, of which 17 have already ended fatally and others are likely to do so. The attacks have been very much less frequent during the last 3 days, and I hope that the epidemic is giving way before the measures opposed to it. About 2,000 coolies, however, have left the works, and as a great number of these are from Tinnevelly, it is nearly certain that but few will return during the present working season and possibly more still may go away. I am, therefore, compelled to ask you, by telegram despatched to-day, to accept a surrender of Rs. 25,000 from the grant for Periyár main dam. The works are still so disorganised that I cannot yet form a very accurate estimate of my probable expenditure during March, and it is possible that I may be obliged to surrender Rs. 5,000 or 10,000 more still, of which the earliest possible intimation will be given you.

2. I beg that the present surrender, if sanctioned, may be communicated to the Examiner as early as possible.

3. I regret to say that among the deaths from cholera has been that of my Head Accountant and Manager Mr. C. W. Taylor.

ORDER—dated 10th March 1894, No. 223 I., Public Works.

The Government regrets the large number of deaths reported in the foregoing letter to have occurred from cholera. The surrender of Rs. 25,000 or Rs. 30,000 including establishment has already been reported to, and accepted by, the Government of India in the orders marginally noted. It is now too late for any further surrender. Should a portion of the current year's existing grant for the No. I Periyár division remain unspent at the end of the year, the unavoidable cause of the lapse should be explained in the Superintendent of Works' Administration Report for the current year.

G.O., No. 188 I., dated 28th February 1894.
G.O., No. 202 I., dated 5th March 1894.

2. Ordered that a copy of these Proceedings be forwarded to the Government of India for information.

[Here enter No. 224 I., dated 10th March 1894.]

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
,, Superintendent of Works, No. I Periyár Division.
,, Examiner, Public Works Accounts.

Endorsement—dated 10th March 1894, No. 224 I., Public Works.

Forwarded.

(By Order.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

IRRIGATION.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 10*th*.

Recd. *Encl.*

G.O., 10th Mar. 1894, Nos. 223, 224 I.

MARCH.

Periyar Project

Forwarding copy of Proceedings on the surrender of Rs. 30,000 from the grant for the Periyár main dam owing to prevalence of cholera.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following papers :—

From G. D. WYBROW, Esq., Superintending Engineer, I Circle, to the Chief Engineer for Irrigation, dated Janamilli, 25th February 1894, No. 1092 G.N.

In continuation of my telegram No. 156 T., dated the 19th instant, I have the honour to inform you that the Executive Engineer, Rushikulya Division, reports that Gulleri works are now in good progress, and as they are more important all the available labour has been diverted on them. The progress of the agricultural works in the neighbourhood has therefore been impeded for the present.

2. The Executive Engineer has therefore considered it advisable to surrender a sum of Rs. 1,500 out of his existing grant of Rs. 3,000 under "Agricultural Repairs," and I request you will be good enough to obtain the sanction of Government to the same.

3. The reduced grant will then stand at Rs. 1,500. But the expenditure under this head of account up to the end of January 1894 is Rs. 1,588. The excess will be met by transfer from the existing grant of Rs. 1,000 under "Agricultural Original Works," the proposal for which will be submitted shortly.

From G. D. WYBROW, Esq., Superintending Engineer, I Circle, to the Chief Engineer for Irrigation, dated Dowlaishweram, 25th February 1894, No. 1093 G.N.

In continuation of paragraph 3 of my letter No. 1092 G.N., dated 25th February 1894, I have the honour to request that you will be good enough to obtain the sanction of Government to transfer Rs. 88 to "Agricultural Repairs" from the existing grant of Rs. 1,000 under "Agricultural Original Works," Rushikulya division.

2. If the above proposal is sanctioned, the grants under "Agricultural Works" of the Rushikulya division will stand as follows :—

	RS.
Agricultural original works	912
Do. repairs	1,588

ORDER—dated 10th March 1894, No. 225 I., Public Works.

The surrender of Rs. 1,500 from the grant for Agricultural Works, River Embankment, Repairs, has already been accepted in G.O., No. 173 I., dated 21st February 1894. The proposed transfer of Rs. 88 from the grant for Agricultural Works, River Embankment, Minor Original Works, to Repairs is sanctioned.

(True Extract.)

(Signed) R. R. E. DRAKE-BROCKMAN, Lt.-Col., R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch

To the Chief Engineer for Irrigation.
" Superintending Engineer, I Circle.
" Examiner, Public Works Accounts.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper :—

No. 538 P.R.

Report by the Superintending Engineer, VI Circle, on the estimate for constructing a superpassage at $2\frac{1}{2}$ miles in the 10th Branch channel, Periyár project.

	RS.
Amount of original estimate sanctioned for 2 culverts on plan No. 68 (in Blue book, page No. 42)	5,480
Amount of revised estimate as per accompanied plan	4,350
Saving ...	1,130

The drainage area of the odai is about $6\frac{1}{2}$ miles and the calculated maximum discharge from this area is 2,088 cubic feet per second, using the formula $D = C M^{\frac{2}{3}}$, C being equal to 600. The Chief Engineer has laid down in his inspection notes that the velocity through the duct may be 12 feet per second. Taking this as the velocity, the waterway required is 175 square feet. The area will be obtained when the depth of the water in the duct is 5 feet.

2. The present plan and estimate are submitted to the Chief Engineer, Public Works Department, for approval and early sanction of Government.

TRICHINOPOLY,
27th February 1894.

(Signed) A. W. SMART, Lt.-Col., R.E.,
Superintending Engineer, VI Circle.

ORDER—dated 10th March 1894, No. 227 I., Public Works.

The following estimate is sanctioned in lieu of the sanctioned provision of Rs. 5,480 for two culverts in the 10th Branch channel, Periyár project, the saving of Rs. 1,130 effected by the present estimate being added to the amount provided for

unforeseen works in the revised estimate for the project printed in Proceedings of the Madras Government, No. 97 I., dated 3rd February 1894, on receipt of the sanction of the Government of India thereto :—

Capital Expenditure not charged to Revenue.
49. Irrigation.
Periyár Project.
I. Works.
3. Distributaries.
10th Branch Channel.
6. Cross Drainage Works.

	RS.
Constructing No. 2 superpassage at 2 miles 4 furlongs and 100 feet, estimate	4,350

2. This sanction is registered as No. 207 I. of 1893–94.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.WD.

To the Chief Engineer for Irrigation.
" Superintending Engineer, VI Circle,
with three enclosures.
" Examiner, Public Works Accounts.
" Revenue Department.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper :—

No. 527 P.R.

Report by the Superintending Engineer, VI Circle, on the estimate for constructing a superpassage at 1 mile 4 furlongs and 280 feet, 10th Branch channel, Periyár project :—

		RS.
Amount of original estimate sanctioned for two culverts on plan No. 68 (in Blue-book, page No. 42)	... ...	5,480
Amount of revised estimate as per accompanying plan	... ...	3,440
	Saving	2,040

The drainage area of the odai is about $3\frac{1}{2}$ square miles and the calculated maximum discharge from this area is 1,380 cubic feet per second, using the formula $D = C.M.^{\frac{3}{4}}$, C being equal to 600. The Chief Engineer has laid down in his inspection notes * that the velocity through the duct may be 12 feet per second. Taking this as the velocity, the water-way required is 115 square feet. The area will be obtained when the depth of the water in the duct is 5 feet. The discharge of the channel at site for superpassage is 230 cubic feet per second.

* Printed with G.O., No. 262 I., dated 17th March 1891.

2. The present plan and estimate are submitted to the Chief Engineer, Public Works Department, for approval and early sanction of Government.

TRICHINOPOLY,
24th February 1894.

(Signed) A. W. SMART, Lt.-Col., R.E.,
Superintending Engineer, VI Circle.

ORDER—dated 13th March 1894, No. 243 I., Public Works.

The following revised estimate is sanctioned in lieu of the sanctioned provision of Rs. 5,480 for two culverts in the 10th Branch channel, Periyár project, the saving of Rs. 2,040 effected by the present estimate being added to the amount reserved for unforeseen works in the revised estimate for the project printed in Proceedings of the Madras Government, No. 97 I., dated 3rd February 1894, on receipt of the sanction of the Government of India thereto :—

Capital Expenditure not charged to Revenue.
49. Irrigation.
Periyár Project.
1. Works.
3. Distributaries.
10th Branch Channel.
6. Cross Drainage Works.

	RS.
Constructing a superpassage at 1 mile 4 furlongs and 280 feet, estimate	3,440

2. This sanction is registered as No. 210 I. of 1893–94.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
,, Superintending Engineer, VI Circle, with three enclosures.
,, Examiner, Public Works Accounts.
,, Revenue Department.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 13th.

Recd. *Encl.*

G.O., 13th Mar. 1894, No. 243 I.

MARCH.

Periyar Project

The revised estimate of Rs. 3,440 for constructing a superpassage at 1 mile 4 furlongs and 280 feet in the 10th Branch channel, —, sanctioned.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper :—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Periyár, 21st February 1894, No. 277 C.E.

I have the honour to submit, for sanction of Government, an estimate for purchasing iron chatties and galvanized iron buckets amounting to Rs. 1,580 since the amount available at my disposal under Tools and Plant is Rs. 295 only.

ORDER—dated 13th March 1894, No. 244 I., Public Works.

The estimate submitted with the foregoing letter is approved. It should be resubmitted for the formal sanction of Government from the amount provided for further outlay under tools and plant in the revised estimate for the Periyár project submitted in Proceedings of the Madras Government, No. 97 I., dated 3rd February 1894, for the sanction of the Government of India as soon as that sanction is communicated to the Superintendent of Works, No. I Periyár Division.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
,, Superintendent of Works, No. I Periyár Division,
with one enclosure.
,, Examiner, Public Works Accounts.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 13*th*.

Recd. *Encl.*

G.O., 13th Mar. 1894, No. 244 I.

MARCH.

Periyar Project

The estimate of Rs. 1,580 for purchasing iron chatties and galvanized iron buckets for use in No. I Periyár division, approved with remarks.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

No. 437.

Report of progress of works in No. II Periyár division for the month of February 1894.

During the first half of the month there was a great absence of labour, but towards the end the daily average greatly increased. Cholera was, however, still in some villages along the line.

XI Reach ($29\frac{1}{2}$ *to* $36\frac{1}{2}$ *miles*).

Earthwork.—The banking round Kidari rock and through the tanks up to Siruvali large tank was recommenced.

The last two miles of the main channel was definitely settled and demarcated, but it will not be put in hand until further orders.

Masonry—Culvert, $30\frac{1}{4}$ *miles.*—Face walls and coping only remains; will be completed before the 15th March and the following masonry works will be completed on or before that date :—

Superpassage,	$30\frac{7}{8}$ mile,	
Bridge No. 2 at	$32\frac{3}{8}$,,	
Superpassage at	$32\frac{1}{2}$,,	and
Culverts at $33\frac{1}{4}$ &	$33\frac{3}{8}$,,	

Branch channels.

A little work was carried on in the 1st, 4th, 5th and 6th branch channels and to four drops in the 8th.

9*th Branch channel.*—The main line is practically completed ; of the off takes—

Chittampatty.—1st and 2nd miles three-quarter, and 3rd and 4th half, finished.

Kunnathur.—1st and 2nd miles three-quarter done ; 3rd and 4th just commenced.

Papangudi.—Half completed.

10*th Branch channel.*—Earthwork first 5 miles with masonry works in good progress.

The 11*th and* 12*th Branch channels*—have been surveyed and lockspitted, but the execution deferred until further orders.

CHITTAMPATTY,
7th March 1894.

(Signed) G. P. CARLESS,
Ex. Engr., No. II Periyár Division.

No. 557 P.R.

Copy forwarded to the Chief Engineer, Public Works Department.

2. The Executive Engineer has just wired that, owing to change of programme and savings, he is obliged to surrender Rs. 10,000 as reported in to-day's telegram.

TRICHINOPOLY,
9th March 1894.

(Signed) A. W. SMART, Lt.-Col., R.E.,
Superintending Engineer, VI Circle.

Note by the Chief Engineer, Public Works Department.

Submitted for the information of Government.

16th March 1894.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

ORDER—dated 28th March 1894, No. 271 I., Public Works.

Recorded and communicated to the Government of India.

[Here enter No. 272 I., dated 28th March 1894.]

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintending Engineer, VI Circle.
„ Chief Engineer for Irrigation.
„ Revenue Department.

ENDORSEMENT—dated 28th March 1894, No. 272 I., Public Works.

Copy of the above forwarded to the Government of India.

(By Order.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

IRRIGATION.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 28th.

Recd. *Encl.*

G.O., 28th Mar. 1894, Nos. 271, 272 I.

MARCH.

Periyar Project

Forwarding copy of Proceedings recording the progress report of works] in No. II Periyár division for the month of February 1894.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following papers :—

From J. HANNAN, Esq., Superintending Engineer, IV Circle, to the Chief Engineer for Irrigation, dated Coimbatore, 24th November 1893, No. 316 E.I.

I have the honour to forward, for sanction of Government, a supplemental estimate, amounting to Rs. 1,100, for constructing nine inlets and one outlet in the Kukundi branch of Kalavai main channel connected with southern section of the Pálár anicut system, North Arcot division.

2. These works are required to receive the drainage from the fields and ridges on the left side of the channel for which no provision was made in the estimate for the project sanctioned in G.O. No 278 I. of 17th May 1890.

3. The works have been carried out in anticipation of sanction apparently under the verbal orders of Major Smart ; it may be treated as supplemental to the "other cross drainage works Rs. 1,310"—*vide* classified abstract estimate, page 8 of the Government Order quoted above.

No. 10/VI.

Forwarded to Lieutenant-Colonel A. W. Smart, R.E., Superintending Engineer, VI Circle, for report whether these designs were approved by him and whether he gave orders for the execution of the work without an estimate and without sanction.

(By Order)

MADRAS,
28th November 1893.

(Signed) F. W. ASHPITEL,
Asst. Chief Engineer for Irrigation.

From Lieutenant-Colonel A. W. SMART, R.E., Superintending Engineer, VI Circle, to the Chief Engineer for Irrigation, dated Trichinopoly, 5th December 1893, No. 1279 T.C.

With reference to your No. 10/VI, dated 28th November 1893, I have the honour to state that, as far as I remember, I gave no orders for the construction of the inlets and outlets in the Kukundi branch channel according to the plans now submitted. When going over the channel there were several places which I noticed were being cut away by the run-off drainage, and I ordered rough stone to be there used to hold up the soil, the cost of which I ordered to be charged against the estimate—*vide* my inspection notes. This order appears to have been misunderstood or misinterpreted.

The plans of works built at C.S. 84 and 98 I do not understand, the walls have apparently been built where the channel is in embankment.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

Read—the following paper :—

From N. F. MACKENZIE, Esq., Under Secretary to the Government of India, Public Works Department (Civil Works—Irrigation), to the Secretary to the Government of Madras, Public Works Department, dated Calcutta, 15th March 1894, No. 81 I.

I am directed to acknowledge the receipt of your letter No. 148 I., dated the 17th February 1894, forwarding a copy of the Proceedings of the Government of Madras embodying a note by the Chief Engineer, Public Works Department, which contains the information required by the Government of India regarding the proposed tunnel in the Periyár main dam.

2. In reply, I am to say that the Government of India approve of the construction of the proposed tunnel and will be glad to receive, from time to time, either through the monthly progress reports, or in such form as may be most convenient to the Government of Madras, any further information regarding the tunnel which may be considered of interest.

3. The plans received with your letter under acknowledgment are returned herewith.

Order—dated 28th March 1894, No. 278 I., Public Works.

Recorded.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintendent of Works, Periyár Project.

IRRIGATION.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 28th.

Recd. *Encl.*

G.O., 28th Mar. 1894, No. 278 I.

MARCH.

Tunnel in the Periyar Main Dam

Letter from the Government of India approving of the construction of the proposed — and requesting to be furnished with any further information of interest regarding the tunnel, recorded.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

No. 289 C.E.

REPORT on progress of work in No. I Periyár division for the month of February 1894.

General.—Fair weather and unprecedented rate of progress at the beginning of the month promised an excellent record for the period under review. A case of cholera, imported on the 16th, however developed quickly into an epidemic of such severity as to scatter all present hopes of good progress and to mark this month as one of the most unfortunate in the history of the works.

Health.—The hospital statistics for the month form no guide to the general health of the camps, for the hospital staff were entirely concentrated on efforts to stamp out the cholera epidemic and the attendance of sufferers from other complaints fell off accordingly. It can only be said that, as compared with the previous month, there was no marked change either for better or for worse. As above mentioned, the first case of cholera was imported on the 16th February. The following day two more cases occurred, both of which were immediately traceable to importation, and on the 18th a fourth case was reported of a man just arrived in the camp. The epidemic, which sprang from these four, had by the end of February attacked 48 persons, of whom 21 had died. Among the latter was most unfortunately included Mr. C. W. Taylor, the head accountant of the division, a most valuable and promising young member of the Accounts department.

It may be added that by the 9th March there had occurred 85 cases in camp, of which 48 had ended fatally and that by that date the population of the Periyár camp had been reduced to so small a handful that it was impossible to carry on work longer on the main dam, left bank escape, or minor works at Periyár. On the present date of writing (12th March) the disease still continues. At Thekady camp no cases of cholera occurred, but a number of cases and of deaths are reported to have occurred on the roads in the neighbourhood among coolies fleeing from the works. It will be remembered that a great part of the Periyár camp was accidentally burnt down in December. Of the remainder it was necessary to burn down infected houses one after another till eventually the whole cooly camp has ceased to exist and will have to be entirely rebuilt.

Rainfall.—At Periyár 0·68 inches, at Thekady 0·52 inches.

Main dam.—The accompanying sections and photographs show the amount of progress made in February. The figures were as follows :—

	CUBIC FEET.
Concrete	126,376
Rubble	43,981
Total ...	170,357

It may be added that in March the amount of material put into the dam up to the time, when the work came to a standstill, was as follows :—

	CUBIC FEET.
Concrete	10,294
Rubble	7,249
Total ...	17,543

The total addition to the dam during the present working season has been 1,056,353 cubic feet, which, notwithstanding the premature close of the work, is considerably greater than any previous season's record. All stocks were considerably drawn upon during the period under review with the exception of the two most important ones of sand and surki which were increased. The present closure of the works will be mainly devoted to amassing sufficient stocks for next working season.

Left bank escape.—The excavation of foundations was proceeded with slowly.

Water-shed tunnel.—A meeting was accurately effected between the No. I shaft boring and the No. II shaft southward boring. The No. II shaft northward boring was carried forward 65 feet so long as the stock of fuel held out. The boring was then abandoned with a view to completing the tunnel by water power from the north end so soon as the monsoon rains furnish the requisite supply. The state of progress is illustrated on the accompanying section, from which it will be seen that about two months' work remains to be done, which will probably occupy July and August.

Water-shed cutting.—Steady progress was made with this work, 18,500 cubic feet being taken out of the small space which is now all that remains available for employment of labour. Endeavours will be made to carry on this work through the recess without interruption, with a view to achieving its completion before the beginning of the rains.

Transport.—An unusually good harvest in the Cumbum valley and the consequent difficulty in procuring carts interfered to some extent with the carting of lime stone. There is already however a fair stock at Periyár and a small amount only need be carted during the recess to bring the stock balance up to two full months' supply by the beginning of next working season.

The height of the main dam is now such that the floods during the next rains will submerge the road between Thekady and Periyár at three points. At one of these a ferry will be required for which arrangements are in progress. The other two will be avoided by a diversion which was begun during the month under review and will shortly be completed. Two old posts on the ghât wire ropeway were renewed and the ropeway is ready to recommence work on receipt of the new wire-ropes indented for from England.

The full supply level of the Cumuli reservoir was raised during February by 1½ feet which, it is hoped, will, with an average rainfall, ensure an uninterrupted supply to the ropeway turbine from 1st July till the end of January.

PERIYAR,
13th March 1894.

(Signed) S. D. PEARS,
Supt. of Works, No. I Periyár Division.

Note by the Chief Engineer, Public Works Department.

Submitted for the consideration of Government.

2. The progress on the main dam was excellent up to the middle of the month, and, in spite of the complete collapse of operations a few days later, the total amount of work done was but little less than that executed in January, bringing the total for the season up to more than a million cubic feet.

3. A separate report has been received and submitted to Government regarding the measures rendered necessary by the lamentable outbreak of cholera.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

19th March 1894.

Order—dated 28th March 1894, No. 281 I., Public Works.

Recorded and forwarded to the Government of India.

[Here enter No. 282 I., dated 28th March 1894.]

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintendent of Works, No. I Periyár division.
,, Chief Engineer for Irrigation.
,, Revenue Department.

Endorsement—dated 28th March 1894, No. 282 I., Public Works.

Forwarded.

(By Order.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

IRRIGATION.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 28th.

Recd. *Encl.*

G.O., 28th Mar. 1894, Nos. 281, 282 I.

MARCH.

Periyar Project

Forwarding copy of Proceedings recording the progress report of works in No. I Periyár division for the month of February 1894.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Thekady, 24th March 1894, No. 1 C.E.

I have the honour to submit, for your approval and sanction of Government, an estimate, amounting to Rs. 5,550, for the conservancy of the Periyár camps for 1894–95.

2. The popularity of the hospital at Periyár has increased so enormously during the last year that it was found quite indispensable to engage a second compounder a few months ago. From the 1st April 1894 the Thekady as well as the Mulya Pánjan camp will be under the Periyár apothecary, and the services of a second compounder will be still more necessary.

3. The services of the midwife have been of increasing use, not only in that capacity, but in general attendance on all female patients. The apothecary speaks very highly of the present woman as an experienced and willing nurse and finds her of so much use that I beg to be allowed to retain her services.

4. The other items are much as heretofore, but I have provided for the purchase and maintenance of a cart and bullocks with a view to compliance with the District Surgeon's strong recommendation that all night-soil should be removed beyond the limits of the camp.

5. I have also allowed Rs. 80 for constructing 8 masonry dust-bins instead of the present wooden ones. This is also the outcome of the District Surgeon's recommendation, but I am in correspondence with the Sanitary Commissioner on the subject of cheap incinerators which I am in hopes may be found both cheaper (by allowing a reduction in the number of sweepers) and more efficient than dust-bins.

ORDER—dated 30th March 1894, No. 295 I., Public Works.

The estimate submitted with the foregoing letter is approved. It should be re-submitted for the formal sanction of Government from the amount provided for buildings under I. Head works in the revised estimate for the Periyár project submitted in Proceedings, Madras Government, No. 97 I., dated 3rd February 1894, for the sanction of the Government of India as soon as that sanction is communicated to the Superintendent of Works, No. I Periyár Division.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
" Superintendent of Works, No. I Periyár Division.
" Examiner, Public Works Accounts.
" Revenue Department.

IRRIGATION.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 30th.

Recd. *Encl.*

G.O., 30th Mar. 1894, No. 295 I.

MARCH.

Conservancy Establishment

The estimate of Rs. 5,550 submitted by the Superintendent of Works, No. I Periyár Division, for the — required for the Periyár camps for 1894-95, approved with remarks.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper :—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Thekady, 24th March 1894, No. 3 C.E.

I have the honour to submit herewith, for your approval and the sanction of Government, an estimate, amounting to Rs. 6,600, for rebuilding the cooly lines at Periyár camp which have been burnt down partly by accident and partly for disinfecting purposes.

2. It has been found that 12 feet is the most convenient width for these lines, and allowance has been made for housing 4,800 coolies with 20 square feet for each person.

3. Contingencies have been allowed for at the rate of 10 per cent. instead of the usual 5 with a view to loss by fire.

ORDER—dated 30th March 1894, No. 296 I., Public Works.

The estimate submitted with the foregoing letter is approved. It should be resubmitted for the formal sanction of Government from the amount provided for buildings under 1 Head Works in the revised estimate for the Periyár project submitted in Proceedings of Madras Government, No. 97 I., dated 3rd February 1894, for the sanction of the Government of India as soon as that sanction is communicated to the Superintendent of Works, No. I Periyár Division.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
" Superintendent of Works, No. I Periyár Division, with one estimate.
" Examiner, Public Works Accounts.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 30th.

Recd. *Encl.*

G.O., 30th Mar. 1894, No. 296 I.

MARCH.

Cooly lines at Periyar Camp

The estimate of Rs. 6,600 submitted by the Superintendent of Works, No. I Periyár Division, for rebuilding the —, approved with remarks.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following paper:—

From S. D. PEARS, Esq., Superintendent of Works, No. I Periyár Division, to the Chief Engineer, Public Works Department, dated Periyár, 16th March 1894, No. 297 C.E.

I have the honour to submit, for sanction of Government, an estimate, amounting to Rs. 3,700, for wrought iron tubes with flanges, &c., purchased from England under G.Os., Nos. 1355 W., dated 19th May 1893, and 2962 W., dated 16th November 1893.

ORDER—dated 30th March 1894, No. 297 I., Public Works.

The estimate submitted with the foregoing letter is approved. It should be resubmitted for the formal sanction of Government from the amount provided for further outlay under Tools and Plant in the revised estimate for the Periyár project submitted in Proceedings of Madras Government, No. 97 I., dated 3rd February 1894, for the sanction of the Government of India as soon as that sanction is communicated to the Superintendent of Works, No. I Periyár Division.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
„ Superintendent of Works,
No. I Periyár Division, with one estimate.
„ Examiner, Public Works Accounts.

IRRIGATION.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 30th.

Recd. *Encl.*

G.O., 30th Mar. 1894, No. 297 I.

MARCH.

No. I Periyar Division

The estimate of Rs. 3,700 for wrought iron tubes with flanges, &c., purchased from England for use in —, approved with remarks.